ANNUAL PROGRESS REPORT

NOVEMBER 1, 1996 - OCTOBER 31, 1997

DATA REDUCTION AND ANALYSIS FROM THE SOHO SPACECRAFT

NASA Grant NAG5-2754

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We continue to analyze and interpret data from the MTOF sensor on SoHO, using recently obtained calibration data to improve our understanding of instrument response. We have presented a number of talks demonstrating the excellent instrument resolution and also displaying the temporal behavior of solar wind Fe^{54} and Fe^{56} isotopes and the element Cr(52). In addition, the isotopic ratios $Ne^{20}/Ne^{22} = (13.8 \pm 0.7)$ and $Ne^{20}/Ne^{21} = (440 \pm 110)$ were obtained from MTOF data. These ratios agree with the values obtained from the Apollo foil solar wind experiments and with values which have been derived from measurements on lunar and meteoritic samples.

Talks on CELIAS were given at a variety of venues, including the AAAS Meeting in Seattle, the AGU Spring Meeting in Baltimore, and at IAGA in Uppsala. Papers have been submitted to the Journal of Geophysical Research, to Solar Physics, and to GRL. The talks and papers are listed in a complete bibliography accompanying this report as an appendix.

We have also spent considerable effort in establishing and maintaining a page on the World Wide Web that presents almost real-time solar wind data from our MTOF/PM subsensor on the SoHO spacecraft. It was announced in an on-line news letter (SPA section newsletter, Vol 3, Issue 66) that is circulated to space physics people. Presently, the PM page receives about 700 "hits" per day. The URL is:

`http://umtof.umd.edu/pm`

The PM web page has recently been revised and improved. The algorithms used to derive solar wind parameters from the PM data were refined and tested over a time period of months, and the organizational structure of the web page was substantially changed. In addition, the angle out of the ecliptic plane was added to the list of parameters which are plotted.

The web page contains plots of solar wind parameters for the most recent 2 days of data and the most recent 2 weeks of data. The solar wind parameters plotted are bulk speed, proton density, thermal speed, and angle out of the ecliptic plane. The current location of the SoHO spacecraft, taken from predicted orbit files, is also displayed on the page.

Links on the page lead to descriptions of the plotted parameters and the PM sensor, and to the SoHO space craft home page, as well as older data organized by Carrington Rotation, and to older orbit data. The older PM data is available in the form of tables of ASCII data and also in the form of plots. The older

orbit data is a plain text table; the data that it contains was taken from definitive Orbit data.

Data files are transferred electronically via FTP from the EOF to the UMTOF system at Maryland. The PM page is updated automatically within a few minutes of the receipt of a file from the EOF At five minute intervals, a batch job on our AlphaStation checks to see if a new file has arrived. If one has, the data is processed using a FORTRAN program and new plots are generated by IDL as needed; human intervention is not required.

SoHO is never in the magnetosphere and enjoys excellent data coverage. The data on the Web page are typically between a few minutes and a few hours old.

The PM is a subsensor of the MTOF instrument, which is one of the 3 time-of-flight instruments comprising the CELIAS experiment. MTOF determines high resolution mass spectra of heavy solar wind ions and uses a very wide bandwidth energy-per-charge analyzer to maximize counting statistics. The PM was designed to assist in the interpretation of MTOF data and for that reason uses a similar wide bandwidth analyzer that limits the accuracy of derived solar wind parameters. A preliminary comparison of PM parameters with those derived from the SWE instrument on the WIND spacecraft (courtesy K. Ogilvie and A. Lazarus) results in the following values for the sigma of the distribution of the ratios of parameters derived by the 2 instruments: proton bulk speed $\cong$ 2%, density $\cong$ 17%, thermal speed $\cong$ 16%.

In addition to the above activities we of course routinely monitor the health of the MTOF instrument, and support the various spacecraft maneuvers with appropriate command sessions to reduce our high voltages during thruster burns, followed by re-establishing the nominal mode for MTOF.

Every day at noon, a pair of programs are automatically run on the latest files received from the EOF. These programs write housekeeping and rate information to ASCII files which are then sent via electronic mail to several members of our group. Visual examination of these files provides a check on instrument health, and could give rapid warning if an instrument problem were to arise. Another program that is automatically run at noon each day generates a binary file of rate information suitable for analysis on a Macintosh.

In order to monitor the health of the instrument and the quality of the data in the longer term, several programs are run each day that read the most recent Level Zero file. The same programs whose output print out rate and

housekeeping information for both the MTOF main sensor and the PM subsensor. Another program finds the minimum and maximum values of various housekeeping quantities, and still another generates a binary file of rate information suitable for analysis on a Macintosh.

Flight operations for the CELIAS experiment during the reporting period (November 1996 to present) have included the following:

Safing and recovery of the MTOF, STOF, PM, and CTOF sensors during SoHO operations which involve the use of thrusters (station keeping, momentum management, and reaction wheel maintenance) These operations take place approximately every 3 months, and typically require commanding over a 4-5 day period.

Special commanding has been required for CTOF (which began experiencing problems in August 1996), and for software patches to the DPU (patches 12, 13, and 14).

New TSTOL procedures have been created for the DPU, MTOF and STOF.

Documentation on the CELIAS ESR response and the MTOF emergency procedures have been supplied to the SOC.

CELIAS housekeeping is processed daily and sent to MPAE, MPE, and UMD. We have responded to the FOT regarding yellow and red flags observed for CTOF, STOF, and MTOF parameters.